DOCUMENT RESUME

ED 190 214 PS 011 546

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TITLE Lasting Effects After Preschool. [Conference Presentation].
SPONS AGENCY Administration for Children, Youth, and Families (DHEW), Washington, D.C.: William and Flora Hewlett Foundation, Palo Alto, Calif.
PUB DATE Jan 80
NOTE 24p.: For related documents, see ED 148 470-471, ED 175 523 and ED 175 577. Paper presented at the meeting of the International Congress on Early Childhood Education (Tel Aviv, Israel, January 7, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Comparative Analysis: Failure: Longitudinal Studies: *Low Income Groups: *Outcomes of Education: *Preschool Education: *Program Effectiveness: School Holding Power: Scores: Special Programs: *Testing: Test Results
IDENTIFIERS *Consortium for Longitudinal Studies

ABSTRACT

This study reports evidence that early childhood programs can have an impact on the academic careers of children from low-income homes. A wide variety of status and process variables were collected by several individual investigators over four waves, or time periods, of data collection. Before pooling data from 14 longitudinal research and demonstration projects into a Consortium for Longitudinal Studies, investigators had collected diverse preprogram child and family measures (Wave 1) and then numerous and varied post-program outcome measures over several years (Wave 2). In the consortium-organized follow-ups of 1976 and 1979 (Waves 3 and 4), a core of common measures was collected. Measures from all four waves included preprogram background data, standardized IQ, achievement and project-developed tests, school record information, and student and parent interviews. All hypotheses were tested using program treatment children and a control group of children from the same project site. Findings replicate results on IQ reported by numerous previous investigators and show that preschool graduates had significantly fewer school failure experiences than did the control groups and were less likely to be assigned to special education classes or to be retained in the same grade. Additional analyses indicate that preschool outcomes were not affected by various preprogram and demographic factors. Overall results reveal that preschool had a significant effect on intelligence test scores for up to 3 or 4 years after the end of the preschool program. (Author/RH)

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LASTING EFFECTS AFTER PRESCHOOL

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PS011546

Paper presented at the meeting of the International Congress on Early Childhood Education, Tel Aviv, January 7, 1980. This research was supported in part by the Administration for Children, Youth, and Families (OHDS; DHEW); Maternal and Child Health, and the William and Flora Hewlett Foundation.

*This paper was prepared by Jacqueline Royce, Ann Snipper, Harry Murray, Irving Lazar, and me. Longer reports are available.

The Consortium for Longitudinal Studies is a cooperative effort of over a dozen investigators endeavoring to assess the long-term effects of early education on the lives of children from low-income families.* The principal investigators, who conducted 14 longitudinal research and demonstration projects in the 1960s, agreed to pool their original data and to collect common follow-up measures for joint analysis.

Background of Consortium

The Consortium for Longitudinal Studies was formed in 1975 for this purpose. A group of early childhood investigators who had independently conducted experimental infant and preschool programs for low-income children in the 1960s began a series of meetings chaired by Irving Lazar of Cornell University. The group, originally named the Consortium for Developmental Continuity, included: E. Kuno Beller, Temple University; Martin and Cynthia Deutsch, New York University; Ira Gordon (deceased September, 1978); Susan Gray, George Peabody College; Merle Karnes, University of Illinois; Phyllis Levenstein, Verbal Interaction Project; Louise Miller, University of Louisville; Francis Palmer, Merrill-Palmer Institute; David Weikart, High/Scope Foundation; Myron Woolman, Institute for Educational Research; and Edward Zigler, Yale University.

Several concerns led to the formation of the Consortium. Since the release of the Westinghouse Report on Project Head Start in 1969, most people assumed that preschool effects lasted little past the end of the program. The Consortium members felt that their subjects (aged 8 to 18 at that time) were old enough to provide a test of the long-term effects of preschool.

The meetings resulted in a decision to pool the data which each investigator had collected individually and to collaborate on a common follow-up data collection and analysis effort. Each investigator agreed to send his or her raw original and common follow-up data to Cornell to form a Consortium data bank. Parallel or pooled analyses with raw data would be undertaken at Cornell, but each member retained full rights to release raw data to others and to publish his or her own findings. I joined the Consortium in 1977 to direct Consortium data collection and analyses along with Irving Lazar. Robert Jester of the University of Florida, now a principal investigator for the Gordon project, became a Consortium member after Ira Gordon's death. The Consortium for Longitudinal Studies originated and continues to exist principally through a strong commitment to a collaborative effort.

Description of Consortium Early Child Development Studies

The early education programs in the Consortium studies were located in urban and rural sites in the Northeast, Southeast, and Midwest (see Table 1). The programs were active from 1962 to 1972; only Levenstein's Verbal Interaction Project, Weikart's Perry Preschool Program, and Karnes' GOAL program are in operation at the present time. Depending on the theoretical interest of the investigator, curricula included programs based on the Bank Street child development model, on Montessori methods, on Piagetian theory, on the Bereiter-Engelmann method and others.*

*For full description of Consortium programs, see Consortium, 1977; Consortium, 1978; Lazar, et al. (in press) and individual project reports listed in the reference list.

The Consortium studies can be categorized as center-based, home-based, or combination home visit/center programs. Center-based studies typically provided nursery school programs for 3- or 4-year-olds with varying degrees of structure in the program curriculum. Instruction generally took place in small groups but in some cases was on a one-to-one basis.

Home-based studies directed their educational efforts primarily toward the parent, usually the mother, as the major instrument of change and influence in the child's life. Activities, toys, and games were brought to the family home by a parent educator or home visitor, who taught the mother to use the activities and to promote her child's development through parent-child interaction. These programs served infants and toddlers.

The third group of studies combined these approaches, providing a center-based nursery school program along with a periodic home visits which involved both parent and child. In some programs the emphasis during the home visit was closely related to the center programs; in others, it had a more general content.

The 1976 follow-up sample was composed of 2,008 children from 11 projects. The median project had 64.9% children enrolled in the program, 94.8% of them were black, and 50.0% were female. The medians on the follow-up sample for background variables measured at the time of entry into the projects were: mother's education of 10.4 years; SES (Hollingshead ISP) of 64.0; 3.2 siblings; and pretest Stanford-Binet IQ score of 92.1. The 1976 follow-up sample was very similar to the original sample despite the attrition and changes in groups and projects included in the follow-up.

Measures

A wide variety of status and process variables were collected by individual investigators over four waves or time periods of data collection. Before the formation of the Consortium (1962 to 1975), investigators collected diverse preprogram child and family measures (Wave 1) and then numerous and varied postprogram outcome measures over several years (Wave 2). In the Consortium follow-ups of 1976 and 1979 (Waves 3 and 4), a core of common measures was collected. The measures included in the Consortium data bank are described below.

All investigators, except one,* collected preprogram background data such as education and occupation of mother and father, number of siblings, and father presence in the home as well as sex and ethnicity of child, mother's age at childbirth, and other variables.

The second wave of testing, also conducted independently by the investigators, consisted primarily of standardized IQ and achievement tests and project-developed tests. The majority of projects collected Stanford-Binet and PPVT IQ scores at the various Wave 2 follow-up testing periods.

In 1976 five types of follow-up data were collected in a common format: an individually-administered intelligence test (Wechsler), school record information, scores on school-administered standardized achievement tests, and interviews with the participant and his or her parent (usually the mother).

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*The exception was Beller who collected background demographic data retrospectively as part of the 1976 Consortium Parent Interview.

To guard against artifactual results due to differences between the programs, subjects were never pooled into a single large sample. Instead, all hypothesis tests compared treatment children to control children from the same project site; and the results were pooled using the pooled-z technique.* This method tests the null hypothesis that on the average, across our various programs, preschool has no effect on later school performance.** To insure that no single program accounted for a significant pooled result, results were tested for what we called "robustness" by deleting the program with the strongest result from the analysis and recalculating the pooled-z score. Projects with designs most appropriate to test the effectiveness of preschool were analyzed separately from the quasi-experimental projects. The p values reported here are two-tailed.

Attrition due to mobility, death, or other events is a serious threat to the validity of a longitudinal study. The projects used in the pooled-z analyses reported here had a median recovery rate of 75%. Virtually all attrition was due to inability to find subjects; less than 3% of the recovered subjects refused to participate.

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*F. Mosteller and R.R. Bush, in Handbook of Social Psychology, G. Lindzey, Ed. (Addison-Wesley, Reading, Mass., 1954). For each project the exact p value of the result was calculated and converted to a z score with the sign corresponding to the direction of the effect. The z scores were then summed: $z = \Sigma z_i/\sqrt{k}$, where z_i is the z score from project i and k is the number of projects. The significance of the pooled z score was then determined. Since contrary results in different projects cancel one another out, this tests the "average" effect of preschool. When results were tested by chi-square, uncorrected chi-squares were calculated [G. Camilli and K. Hopkins, Psychol. Bull. 85, 1(1978)].

**A less conservative null hypothesis would be: preschool has no effect on children's later school performance. This hypothesis could be rejected on the basis of the successful outcome of a single program.

Analyses were performed to assess whether the total samples found on follow-up differed from the total original samples, whether the found treatment group subjects differed from the found control group subjects, and whether the pattern of attrition differed for treatment and control groups. These analyses yielded results consistent with the hypothesis that attrition was essentially random, introducing no known biases into our results.

Results

Our findings replicated results on IQ reported by numerous previous investigators -- large effects when children are tested soon after the program, tapering down to smaller but statistically significant effects 3 or 4 years after preschool, and vanishing thereafter. This finding has a positive aspect -- if 1 year of enrichment has effects 3 or 4 years later, than 12 years of enriched schooling might have lifelong effects. IQ scores, however, are merely indirect predictors of school success; our most important analyses concerned the effect of preschool on direct measures of school success.

In the 1976 follow-up, investigators examined school records to determine whether their subjects were progressing with their agemates or had run into difficulty and were assigned to special education classes or retained in grade at any time in their school careers.* We combined the two indicators to form a composite variable: students who met school requirements versus children who failed to meet school

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*For the median project, subjects were in 7th grade when school data were collected. Special education placements included classrooms for children diagnosed as mentally retarded (educable or trainable), learning disabled, or emotionally disturbed. Speech and hearing problems were not classified with special education placements.

requirements and were placed in special education classes or retained. Because schools have different policies, practices, and resources for students who fail, each Consortium program group was compared to its own control group within a school district. Results were tested for robustness by deleting the data set with the strongest finding.

As shown in Table 2, preschool graduates had significantly fewer school failure experiences than did the control groups. Across the seven projects with appropriate data, the median rate of failure to meet school requirements was 45% in the control group but only 24% in the program group. The results were statistically significant for the group of seven data sets ($p < .001$) and robust after deleting the strongest project. The results were even stronger for data sets with experimental research designs.

When the two indicators of school competence were analyzed separately, preschool apparently had a stronger effect on rate of special education assignment than it did on grade retention. As shown in Table 3, the median rate of assignment to special education classes was 29% for the control group but only 14% in the program group among the six data sets with appropriate data. The combined results were statistically significant ($p < .001$) and robust. For grade retention (not shown), across the eight data sets with appropriate data, program children were significantly less likely to experience grade retention than controls ($p = .018$), but this result was not robust. The median rate of grade retention was 25% in the program group compared to 31% in the controls.*

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*The individual p values were: Gordon (.956), Gray (.291), Palmer (.006), Weikart (.065), Beller (.475), Levenstein (.531), Miller (.248, favoring controls), and Zigler (.452). For the four experimental projects, the results were stronger (pooled $p = .004$), but again they were not robust.

Although program and control groups generally did not differ significantly on background variables measured before preschool, we used standard multiple regression to control for observed differences in school competence analyses. Covariates controlled in this way were: level of maternal education (in grades completed), father presence versus absence, number of siblings, sex, ethnicity (black versus white), and preprogram IQ score. On the average, controlling for background and initial cognitive ability factors, 16% more of the preschool graduates than controls were on grade in regular classes rather than assigned to special education classes or retained in grade. Results were significant (pooled $p < .001$) and robust.

An analysis of the special education data by program variation confirms this result. All but one of the projects with special education data included more than one variation of the preschool program. There were altogether seven different program variations which could be compared to well-matched control groups on frequency of placement in regular classes instead of special education classes. In all seven programs the proportion of program children placed in regular classes exceeded the proportion of control-group children so placed. The probability that this would occur by chance is .020. The seven programs were ranked on effectiveness, as measured by the difference between proportions of program and control children placed in regular classrooms. In the median program on this ranking, 29.4% of the control group children were placed in special education classes compared to only 5.3% of the experimental-group children.

The second question we addressed was whether certain kinds of children benefitted from preschool (the differential effects of the school competence outcome measures). This question derives from a widely held assumption that, for example, children with higher initial IQ scores or those from relatively higher SES backgrounds benefit more from preschool programs. We used regression analysis to test for evidence of differential effectiveness. We found that the positive effects of preschool on school competence were not affected by the child's preprogram IQ score, gender, mother's educational level, family structure, family size, or ethnic group.

The effect of preschool on IQ scores over time was also analyzed. Overall results indicated that preschool had a significant effect on intelligence test scores for up to 3 or 4 years after the end of the preschool program. Similarly, the difference was significant for experimental projects only at immediate post-test, 1 year after and 2 years after. Thus, results indicate that preschool increased children's IQ scores for at least 2 years after the program with some evidence of an increase for 3 or 4 years afterwards. Analysis of the WISC-R data collected in 1976 indicated that the effect of preschool on IQ scores is not permanent.*

We also examined the possibility of differential effects of preschool on IQ scores (i.e., the possibility that preschool affected one type of child differently from another). Results did not indicate any differential effects.

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*Results were not pooled across projects because the tests were administered at different ages and at different number of years after the programs. Only the projects with the youngest samples had IQ score differences in 1976. (See Consortium, 1978.)

Analysis of achievement test data collected by the schools involved far greater methodological problems than any of our other analyses due to more missing data, children taking different tests or different versions or levels of a test, etc. The achievement test analyses are still ongoing. Initial pooled results indicate a significant difference favoring the program groups in mathematics subtests but not in reading, at the fourth grade (the grade for which most projects had data).

Our work is described in more detail in a work in the Child Development Monograph series, which should appear later this year. In addition, a government report of about 250 pages is now available for $6 while a 58-page summary is also available.

We believe that our work has been important in two recent developments in the United States. The annual budget for Head Start preschool programs was increased by about $160 million, after years of neglect. And the United States Department of Defense has recently decided that preschool programs should be provided for children of military personnel at all military bases.

These school performance results indicate that the prevailing pessimism about the long-term effectiveness of early education programs was premature. Preschool helped low-income children meet the requirements of their schools. Children who participated in Consortium preschool programs were significantly more likely than controls to be on grade in regular classrooms rather than assigned to special education classrooms or retained in grade during their school careers. These outcome measures of school success or failure are direct

indications of social competence (Zigler & Trickett, 1978). The child has met society's initial expectations thereby increasing his or her future options.

Summary

The Consortium for Longitudinal Studies has provided evidence that early childhood programs can have an impact on the academic careers of low-income children. This effect can be measured both in terms of performance on standardized tests and in terms of actually meeting the requirements of normal progression as defined by the schools. The four waves of data collection continue to provide an opportunity to evaluate the effect of preschool on various outcomes as the sample reaches young adulthood.

Table 1

Characteristics of Early Education Programs and Ages of Subjects for Each Data Set

Principal Investigator	Early Education Program	Location	Type of Delivery System	Subject Birth Year	Age at Entry to Program	Length of Program (years)	Years of Program
Beller	The Philadelphia Project	Philadelphia, Pennsylvania	Center	1959	4 years	1 year	1963-64
Deutsch	Institute for Developmental Studies	New York, New York	Center	1958-61	4 years	5 years	1963-71
Gordon	The Parent Education Program	Gainesville, Florida	Home	1966-67	3 mos. to 2 years	3 years	1966-70
Gray	The Early Training Project (ETP)	Murfreesboro, Tennessee	Center/ Home	1958	3.8 or 4.8 years	14 mos. or 26 mos.	1962-65
Gray	The Family-Oriented Home Visitor Program	Nashville, Tennessee	Home	1971	birth to 1 year	1 or 2 years	1970-73
Karnes	Curriculum Comparison Study	Champaign-Urbana, Illinois	Center	1961-63	4 years	1 year	1965-66 (2 waves)
Levenstein	The Mother-Child Home Program	Glen Cove, Manhasset & Freeport, Long Island, New York	Home	1964-68	2 years & 3 years	1-1 1/2 years	1967-72
Miller	Experimental Variation of Head Start Curricula	Louisville, Kentucky	Center & Center/ Home	1964	4 years	1 year	1968-69

Table 1 (Cont.)

Principal Investigator	Early Education Program	Location	Type of Delivery System	Subject Birth Year	Age at Entry to Program	Length of Program (years)	Years of Program
Palmer	Harlem Training Project	New York, New York	Center	1964	2 or 3 years	1 or 2 years	1966-68
Weikart	Perry Preschool Project	Ypsilanti, Michigan	Center/ Home	1958-62	3 years (1st wave) 4 years	2 years (1st wave) 1 year	1962-67 (5 waves)
Weikart	Curriculum Demonstration Project	Ypsilanti, Michigan	Center/ Home	1964-65	3 years	2 years	1966-70
Weikart	Carnegie Infant Program	Ypsilanti, Michigan	Home	1968	3 mos. to 2 years	16 mos.	1967-70
Woolman	Micro-Social Learning System	Vineland, New Jersey	Center	1966-68	4 to 5 years	1 to 4 years	1969-73
Zigler	New Haven Follow- Through Study	New Haven, Connecticut	Center	1962-64	5 years	4 years	1967-71

Table 2

Percent of Students who Failed to Meet School Requirements (Placed in Special Education Classes and/or Retained in Grade), Program vs. Control

Project (n)	% Program	% Control	Chi-square	p (2-tail)	Pooled z	Pooled p (2-tail)
Closely approximating experimental design						
Gordon (82)	39.1	61.5	2.25	.134		
Gray (55)	52.8	68.4	1.25	.263		
Palmer (221)	24.1	44.7	7.66	.006		
Weikart (123)	37.2	38.5	6.78	.009		
Median for Experimental Projects (481)	31.6	53.1			4.00	<.001
Quasi-experimental						
Beller (69)	45.9	50.0	.11	.737		
Levenstein (127)	22.1	43.5	4.47	.035		
Miller (125)	20.6	11.1	.89	.356		
Median All Projects (802)	24.1	44.7			3.59	< .001

Note: Data were collected when most of the children were in the following grades: Gordon - 5th grade; Gray - 12th grade; Palmer - 7th grade; Weikart - 4th grade; Beller - 12th grade; Levenstein - 3rd grade; and Miller - 7th grade. Certain control groups were excluded so that the program-control comparison would be as close to experimental as possible.

Table 3

Percent of Subjects Placed in Special Education Classes, Program vs. Control

Project (n)	% Program	% Control	Chi-square	p (2-tail)	Pooled z	Pooled p (2-tail)
Closely approximating experimental design						
Gordon (82)	23.2	53.8	5.10	.0244		
Gray (53)	2.8	29.4	8.16	.0044		
Weikart (123)	13.8	27.7	3.55	.0602		
Median	13.8	29.4			4.04	<.001
Quasi-experimental						
Beller (66)	5.7	3.2	.23	.6315		
Levenstein (125)	13.7	39.1	8.07	.0046		
Miller (109)	20.4	12.5	.55	.4656		
Median All Projects (558)	13.8	28.5			3.52	.001

Note: Data were collected when most of the children were in the following grades: Gordon - 5th grade; Gray - 12th grade; Weikart - 4th grade; Beller - 12th grade; Levenstein - 3rd grade; and Miller - 7th grade. Certain control groups were excluded so that the program-control comparison would be as close to experimental as possible.

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